August 4, 2011

Title 10 – DEPARTMENT OF NATURAL RESOURCES
Division 35 – Land Survey
Chapter 1 – Cadastral Mapping Standards

10 CSR 35-1.010 Organization and Description

PURPOSE: It is desirable for jurisdictions in the state of Missouri to develop a digital multipurpose cadastre in order to make maximum use of data on land parcels. A digital multipurpose cadastre furnishes a consistent framework to delineate, identify, manage and store comprehensive land information at the parcel level and makes it possible to share the data among all potential users statewide. It is the intent of these standards to develop a consistent statewide system that meets the county tax mapping requirements established by the Missouri State Tax Commission.

(1) This standard is intended to make digital cadastral data in our state more uniform and able to accommodate appropriate levels of accuracy. Adherence to this standard will ensure the usability of this spatial data them and its attributes by multiple entities, and assure a consistent manner in which the cadastral parcel spatial data, and related attribute data, are collected, developed and stored. This will enable the data to be merged seamlessly and become transferable regardless of creator or jurisdictional boundaries.

(2) Glossary. As used in this rule, a glossary of terms related to cadastral parcel mapping and this standard is presented below.

(A) GIS Base Map. A map depicting geographic features such as landforms, hydrology systems, roads and landmarks, as well as the USPLSS, government lots, land grants and other political boundaries used for locational reference. This map often includes a geodetic control network as part of its structure, as well as utilizes Registered Section Corner documents for location accuracy. The following are the minimum layers for Cadastral Parcel Base Mapping.

1. Spatially-accurate Digital Orthophotography

2. United States Public Land Survey System (USPLSS) also known as Section, Township and Range layers shall be developed based upon the legal framework as defined in 10 CSR 35-2.010 under General GIS Mapping Requirements.

3. Land parcels based upon deeds, plats, and surveys of record.

(B) Cadastral Data. Information from public records and other sources providing the dimensions, value, ownership, and geographic extent of any recordable interest for the land parcels within a specific geographic land area.

(C) Cadastral Parcel Mapping. Cadastral parcel mapping is an accurately delineated identification of all real property parcels. The cadastral map shall be based upon the Missouri State Plane Coordinate System of 1983 with the legal framework being derived from the USPLSS, existing tax maps, tax database legal descriptions, recorded deeds, recorded surveys, and recorded subdivision plats.

(D) Coordinate Geometry (COGO). A computational method and set of procedures using directions (azimuths or bearings) and lengths or distances to compute and represent coordinate values of boundaries.

(E) Confidence Interval or Level. A computed probability that the "true" positional value will fall within a specified region (e.g., 95% confidence level). Applies only to randomly distributed errors.

(F) County GIS Cadastral Parcel Maps. Tax mapping for Missouri counties compliant with tax mapping guidelines as promulgated by the Missouri State Tax Commission.

(G) Digital Cadastral Parcel Mapping. Digital cadastral parcel mapping encompasses the concepts of automated mapping, graphic display and output, data analysis, and database management as pertains to cadastral parcel mapping. Digital cadastral parcel mapping systems consist of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analyzing, and disseminating information about the location and areas of parcels and the USPLSS.

(H) Digitize. To convert the shapes of geographic features from media such as paper or raster imagery into vector x, y coordinates, lines and polygons.

(I) GIS. A Geographic Information System (GIS) encompasses the concepts of automated mapping, graphic display and output, data analysis, and data base management. A GIS is a system of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analyzing, and disseminating information about areas of the earth.

(J) Heads-Up Digitizing. The process of tracing a line from a scanned image on a computer screen to vectorize raster data.

(K) Metadata. Information about a data set. Metadata for geographical data may include the source of the data, its creation date and format, its projection scale, resolution, and accuracy, and its reliability with regard to some standard.

(L) Metes and Bounds. The limits of a land parcel identified as relative distances and bearings from natural or human-made landmarks. Metes and bounds surveying is often used for areas that are irregularly shaped.

(M) Parcel. For this standard the parcel is defined as a single cadastral unit. A parcel is an area of land which can be described by location and boundaries and for which there is a history of defined, legally recognized interests. Parcel boundaries are usually described in narrative form on a deed as aliquot parts, metes and bounds (bearings and distances), or by lot number and subdivision.

(N) Point. Map points that have no length or area but simply define the coordinate location of a feature.

(O) Polygon. Map polygons are defined by a set of enclosing perimeter polylines creating an area value.

(P) Polyline. Map polylines have a linear extent connecting two points but have no area.

(Q) United States Public Land Survey System (USPLSS). The United States Public Land Survey System consists of a survey executed under the authority of the United States government as recorded on the official plats and field notes of the United States public land survey maintained by the Land Survey Program of the Missouri Department of Natural Resources.

(R) Raster Image. A composite of computer pixels illustrating a graphic image.

(S) Tax Mapping. A document or map for taxation purposes showing the location, dimensions and other relevant information pertaining to a parcel of land subject to property taxes.

(T) Topology. The spatial relationships between connecting or adjacent features in a geographic data layer. Topological relationships are used for spatial modeling operations that do not require coordinate information.

(U) Vector Image. A composite of distinct digital points, lines, or polygons that illustrate a graphic image.

10 CSR 35-1.020 – Minimum Standards for Cadastral Mapping

PURPOSE: This rule describes the standards and requirements for GIS Cadastral parcel mapping in Missouri. Services performed under these standards are associated with research, comprehensive planning, consultation, program management and reports of real property that transforms such information into intelligent data for new and existing programs. It is the intent that these standards conform to the Missouri State Tax Commission Assessor Manual guidelines (revised 2008) or as subsequently revised.

(1) General GIS Mapping Requirements.

(A) Cadastral Data Characteristics. The following standards apply to the parcel characteristics that are intended to meet this standard. The characteristics for the parcel shall contain but are not limited to the following.

1. A cadastral parcel map shall be based upon the surveyed USPLSS. Parcel boundaries are collected from legal records and geographic base data.

2. Source documents, if available and used as reference in creating the cadastral base map, shall be hyperlinked to its appropriate data layer within the GIS.

3. Parcel maps shall be developed in a manner that allows for topological structuring.

4. Clean Spatial Construction – All parcels shall be processed and edited as polygons.

5. All parcel maps shall be continuous and seamless for a county.

6. All parcel maps will completely represent all of the parcels in a defined geographic extent. Any noted problems with completeness shall be noted in the data quality documentation.

7. Every effort shall be made to maintain the geometric integrity of the parcel. In cases where the on-ground reality differs substantially with the deeded, platted or originally mapped parcel, all available research shall be reviewed to resolve the discrepancy to the greatest extent possible.

8. Parcel data shall be linked to the corresponding county's computer-aided mass appraisal (CAMA) database.

(B) Coordinate System and Datum. The coordinate system for Missouri GIS Cadastral Mapping shall be the Missouri Coordinate System of 1983 as defined in Chapters 60.401 to 60.491 RSMo or as subsequently amended. If the mapping is in meters the coordinates may be

converted to U.S. Survey Feet using the conversion of 1 meter equals 3.28083333 feet. This coordinate system shall be the geodetic framework for the Missouri GIS Cadastral Parcel Mapping.

(C) Horizontal Accuracy. GIS Cadastral Mapping should aspire to meet or exceed the Missouri Mapping Standards of 10 CSR 30-6.010 to 6.030 or American Society for Photogrammetry and Remote Sensing (ASPRS).

(D) Vertical Datum. Vertical coordinate values shall be in the North American Vertical Datum of 1988 (NAVD 88) or the most current datum.

(E) Legal Framework. The legal framework for cadastral parcel mapping in Missouri is the United States Public Land Survey System (USPLSS). Other references used to establish the spatial extent of rights in land may include an elevation line or a water height. County boundaries shall be defined as established in Missouri Revised Statutes Title VI, Chapter 46. All GIS Cadastral Parcel Mapping in Missouri shall be referenced to the defined legal framework. The digital cadastre manages and provides access to cadastral information. Digital cadastre does not represent legal property boundaries, nor is it suitable for boundary determination of the individual parcels included in the cadastre. The delineation of the Public Land Survey system shall be the primary framework for the location of the real property land parcels.

(F) Mapping Scheme. All basic digital maps should conform to uniform characteristics of standard scales and the uniform numbering system set forth by the Missouri State Tax Commission Tax Mapping Guidelines.

1. All data shall be compiled at one of four standard map scales.

Rural	1 inch = 400 feet
Semi-Rural	1 inch = 200 feet
Towns & Cities	1 inch = 100 feet
Highly Urbanized	1 inch = 50 feet

2. The county GIS Cadastral Parcel Maps shall be assigned a map sheet number in accordance with the Missouri Uniform Map and Parcel Numbering System, Section 5.7.4 of the State Tax Commission of Missouri Assessors Manual, Technical Assistance, Revision Date 02/01/2008 or the most recent Missouri State Tax Commission regulations.

3. The choice of map scales varies with the density of development and with the size of individual land parcels.

(2) Digital Base Map.

(A) Description. The base map for the digital multipurpose cadastre shall consist of a series of current, accurate, and seamless digital Orthophoto maps, a comprehensively-developed USPLSS section, township and range framework, and all land parcels.

(B) Orthophotography Accuracy Standard. The digital Orthophoto maps shall be based on the Missouri State Plane Coordinate System of 1983 or the most current Missouri State Plane Coordinate datum and shall meet the Missouri Mapping Standards 10 CSR 30-6.010 to 6.030 or the American Society for Photogrammetry and Remote Sensing (ASPRS) standards.

(3) Public Land Survey System Delineation. The foundation for a cadastral base map in Missouri is the United States Public Land Survey System (USPLSS).

(A) Delineation of the USPLSS. A digital USPLSS map data layer shall be the delineation of the lines and/or corners of the United States Public Land Survey System within an accurate spatial context upon a GIS cadastral base map orthophotography. The USPLSS layer will be as accurate a delineation and identification of the original government survey of the State of Missouri as can be achieved through practical application of available research information.

(B) Accuracy Standard. Proper and available survey research shall be utilized to position the USPLSS to its intended location. The appropriate survey research may be acquired from the Missouri Land Survey Repository, County Courthouse and other official authorities. Determination of the digital section and quarter-section corners of the USPLSS shall adhere to the survey principles under which the USPLSS was created. Digital section vertices should be held to a minimum, preferably existing only at the quarter-corners. Data prevalence for the establishment of the digital section corners shall be:

1. Known coordinate points established by a licensed surveyor or as recorded with the Missouri Department of Natural Resources' Land Survey Program.

2. Reference data from available recorded surveys established by the County Surveyor or by licensed private surveyors and/or surveys filed with the Missouri Land Survey Repository.

3. Reference data from land ownership deeds, subdivisions plats, or other recorded land information documentation.

4. Government Land Office (GLO) surveys and notes.

5. Established land use on digital orthophotography.

6. Tax map information.

(C) Documentation for the establishment of the USPLSS section corners shall consist of a point data layer delineating how each corner was set. The USPLSS registered section corner documents and subsequent research shall be hyperlinked to this data layer within the GIS. Delineation attribute may include but may not be limited to:

1. Coordinate
2. Survey
3. Deed
4. Subdivision or Plat
5. GLO
6. Orthophotography
7. Tax Map

(D) Quarter sections will be developed utilizing the standard survey methodology. Deviation shall include one of the above delineations.

(4) GIS Cadastral Parcel Mapping. The GIS Cadastral Parcel Mapping should incorporate the standards set forth by the Missouri State Tax Commission in the most current Assessor Manual guidelines.

(A) Data Quality. The depicted GIS Parcel boundaries are derived from the legal framework. This standard does not provide methods and procedures necessary for resolving problems and discrepancies within or between parcel descriptions. This standard recognizes that, within one parcel map, parcel corners may have varying accuracy and that the accuracy of a parcel corner may be unknown.

(B) Digital Cadastral Mapping. Digital cadastral mapping programs shall be developed so that the following disclaimer is prominently displayed on any digital or hard copy map. *"This Cadastral Map is for tax purposes only. It is not a legal survey of the parcels shown and shall not be used for conveyances or the establishment of property boundaries."*

(C) GIS Cadastral Parcel Map Legal Framework. For GIS cadastral parcel maps, the position of the legal framework is derived from the delineated USPLSS, recorded deeds, recorded surveys, recorded subdivision plats, tax database legal descriptions, digital orthophotography, existing county tax maps, and other pertinent data. GIS Cadastral Parcel Maps shall be developed by referencing the following research and recordable evidence.

1. Delineated USPLSS
2. Recorded surveys/subdivisions
3. Recorded deeds
4. Tax database legal description
5. Digital orthophotography
6. Existing tax maps reference

(D) "Heads-Up" Digitization. One method of data development, often called "heads-up" digitizing, that involves vector conversion of raster-based or digitally scanned tax maps, or methods involving essentially "tracing" scanned raster tax documents shall be considered unacceptable. This method of digital map data development can jeopardize the overall accuracy of the cadastral layer and shall not be utilized for Cadastral Parcel Mapping.

(E) Parcel Ownership Research. Development of the County GIS Cadastral Parcel Maps shall include the following documentation in addition to other materials or research as required to properly develop, maintain and update County GIS Parcel Maps.

1. All recorded vesting instruments that sell, transfer or convey ownership of real property or ownerships including wills and trusts during the period of the contract.

2. All newly recorded subdivisions or resubdivisions of existing subdivisions and all local surveys.

3. All rights-of-way plans for new roads, railroads, and changes of existing rights-of-way for all Federal, State, County and City streets. Final ownership maps must show the rights-of-way of all U.S., State, County, and Municipal highways, roads, streets along with the dimensions of such rights-of-way.

(F) GIS Cadastral Parcel Map Parcels. Parcels defined by metes and bounds descriptions shall be depicted within the GIS by utilizing coordinate geometry (COGO).

(G) Attribute Accuracy (Parcel Map Level). All parcel maps must be able to derive the county specified tax number upon the transfer of the parcel data set(s) to other users. This number applies to tax parcels.

(H) Topological Data Structure. Parcels shall be automated in a manner that allows for topological structuring. All parcels must be processed and edited such that all parcel features are structured into polygons.

(I) Edge Matching. All parcels shall be continuous and seamless within a county and with adjoining counties where mapping has been completed in conformity to these standards.

(J) Completeness. Cadastral Parcel Maps will completely represent all of the parcels in a defined geographic extent. Any noted problems with completeness shall be noted in data quality documentation.

(K) Metadata. Metadata is not part of the parcel map itself, but is contained in supporting files related to the map and will be readily available to any map user.

(5) Tax Mapping Guidelines. The intent is to standardize certain aspects of the mapping program and to present the most common practices mapping personnel should follow to comply with the Tax Mapping Guidelines as promulgated by the Missouri State Tax Commission.

(A) Change in Tax Mapping. Change in tax mapping is the result of either conversion from pen and ink tax mapping to GIS or maintenance resulting from the division or consolidation of existing property configurations as initiated by the recordation and/or filing of a map or document. The assessment tax map system must accomplish the following:

1. Locate all parcels
2. Identify legal owners
3. Delineate boundaries
4. Provide unique identifiers
5. Inventory
6. Provide administrative data
7. Graphic format appropriate for assessment uses
8. Provide for convenient updating and corrections
9. Provide for easy reproduction

(B) Water Boundaries in Tax Mapping. Water boundaries in tax mapping shall include ponds, creeks, river, and lakes. A consistent and defined scale factor shall be used to digitize water boundaries on 1″ = 100′ scale maps, 1″ = 200′ scale maps, and 1″ = 400′ scale maps. The defined scale factor will help with the overall consistency of this layer on the base map. Water boundaries should be digitized with minimal vertices.

(C) Tax Mapping Content. At a minimum and applicable for the associated county, GIS tax maps will depict the following layers, meeting Missouri State Tax Commission Guidelines.

1. Cadastral Layers
   a. Township-Range (polygons)
   b. Section (polygons)
   c. Quarter Section (polygons)
   d. U.S. Survey (Land Grant) (polygons)
   e. Subdivision (polygons)
   f. Map Block (polygons)
   g. Original Block (polygons)
   h. Original Lot (polygons)
   i. Tract (polygons)
   j. Property Parcel (polygons)
   k. County Boundary (polygons)
   l. City Limit (polylines or polygons)
   m. State Line (polylines or polygons)
2. Transportation Layer
   a. Interstate centerlines and right-of-way (polygons)
   b. U.S. Highway centerlines and right-of-way (polygons)
   c. State Highway centerlines and right-of-way (polygons)
   d. State Route centerlines and right-of-way (polygons)
   e. County Road centerlines and right-of-way (polygons)
   f. City Street centerlines and right-of-way (polygons)
   g. Railroad centerlines and right-of-way (polygons)
3. Water Features
   a. Lake (polygons)

b. River (polylines and polygons)

c. Creek (polylines)

d. Ponds (polygons)

4. Miscellaneous Layers

a. School District (polygons)

b. Ambulance District (polygons)

c. Fire District (polygons)

d. Levy Protection District (polygons)

e. Political Township (polygons)

f. Major Utility Easement (polygons)

g. Map Index (polygons)

5. Miscellaneous Features

a. Land Hooks

b. Miscellaneous Text

6. Point Features

a. Buildings on Leased Land (BLL)

7. Labeling

a. Final Map labeling protocols shall match Missouri State Tax Commission Guidelines.

(D) Tax Mapping Maintenance. All changes of ownership boundaries, all newly recorded subdivisions or resubdivisions of existing subdivisions, and all changes of rights-of-way of public roads or newly created public roads shall be included in a county's GIS. The GIS Cadastral Parcel Map shall show by the appropriate name, transmission line easement boundaries such as major gas, oil, or electric and changes in political boundaries.

(E) Uniform Tax Mapping Parcel Numbering System. Refer to State Tax Commission Specifications for procedures on parceling split-offs, condominiums, leaseholds, etc. See Appendage (4) Missouri Uniform Parcel and Map Numbering System.

6. Specifications for Digital Orthophoto Mapping Using Digital Aerial Camera

(A) Digital Orthophoto Standards. Digital Orthophoto standards shall comply with the most current published State of Missouri Digital Orthophotography Standards available.

AUTHORITY: Section 60.670 RSMo (2010).

PUBLIC COST: This proposed amendment will not cost state agencies more than ???.?? dollars ($???) in the aggregate.
PRIVATE COST: This proposed amendment will not cost private entities more than ???.?? dollars ($???) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Missouri Department of Natural Resources, Division of Geology and Land Survey, Sharon Hankins, PO Box 250, Rolla, MO 65402 or via email at sharon.hankins@dnr.mo.gov .